

What is claimed is:

1. A method of virtual multicasting (VMC) multicast content on non-multicast enabled networks, comprising the steps of:

determining if an attached network is multicast enabled, wherein the network includes client computers that have unicast addresses;

if the attached network is not totally multicast enabled, querying for virtual multicast requests for the multicast content from non-multicast enabled client computers;

listening for virtual multicast requests, wherein at least one virtual multicast request includes a unicast address identifying a client computer of the network and a requested method of delivery for the multicast content; and

determining, based on the virtual multicast requests, which client computers request the multicast content, from the unicast addresses, and the requested methods of delivery for the multicast content.

2. The method of claim 1, further comprising the step of:

building a table of requesting client computers based on the requesting client computers determined from the determining step.

3. The method of claim 2, further comprising the steps of:

receiving the multicast content, wherein the multicast content comprises a plurality of packets;

replicating the packets and addressing the packets per the table of requesting client computers; and

transmitting the replicated and addressed packets to the requesting client computers.

4. The method of claim 3, wherein:

the building step builds a VMC client table (VCT) file that includes the identities of the requesting client computers and the unicast addresses of the requesting clients; and

the method further comprises:

reading the VCT file for the identities of the requesting client computers and the unicast addresses of the requesting clients, wherein the replicating step addresses the packets per the unicast addresses of the requesting clients.

5. The method of claim 1, further comprising the steps of:  
selecting an optimal upstream virtual router; and  
forwarding a multicast request for the multicast content to the selected upstream  
virtual router.

5

6. The method of claim 5, wherein the selecting step comprises the steps of:  
determining a router load on upstream virtual routers;  
determining a round trip time on the upstream virtual routers; and  
balancing the determined router loads and round trip times for the upstream virtual  
10 routers, wherein the selecting step selects the upstream virtual router with the best balance  
of router load and round trip time.

7. The method of claim 1, wherein the determining if the attached network is  
multicast enabled comprises the step of:

15 listening for Internet Group Management Protocol (IGMP) queries.

8. The method of claim 1, wherein the querying step comprises the step of:  
issuing virtual IGMP (VIGMP) queries, wherein VIGMP queries query client  
computers for VIGMP reports that request unicast or multicast delivery of the multicast  
20 content.

9. The method of claim 8, wherein the VIGMP reports that request unicast delivery  
of the multicast content include a unicast address for a requesting client computer and a  
multicast address for the multicast content.

25

10. The method of claim 1, wherein the listening step listens for virtual multicast  
requests from downstream virtual routers.

11. The method of claim 10, wherein the listening step listens for virtual multicast  
30 requests from downstream virtual routers by listening for Virtual Multicast Registration  
protocol (VMCRP) reports from the downstream virtual routers.

12. The method of claim 11, wherein the VMCRP reports include a unicast address for a requesting downstream virtual router and a multicast address for the multicast content.

5 13. A computer-readable medium comprising instructions for virtual multicasting (VMC) multicast content on non-multicast enabled networks, by:

determining if an attached network is multicast enabled, wherein the network includes client computers that have unicast addresses;

10 if the attached network is not totally multicast enabled, querying for virtual multicast requests for the multicast content from non-multicast enabled client computers;

listening for virtual multicast requests, wherein at least one virtual multicast request includes a unicast address identifying a client computer of the network and a requested method of delivery for the multicast content; and

15 determining, based on the virtual multicast requests, which client computers request the multicast content, from the unicast addresses, and the requested methods of delivery for the multicast content.

20 14. The computer-readable medium of claim 13, further comprising instructions for: building a table of requesting client computers based on the requesting client computers determined from the determining step.

25 15. The computer-readable medium of claim 14, further comprising instructions for: receiving the multicast content, wherein the multicast content comprises a plurality of packets;

replicating the packets and addressing the packets per the table of requesting client computers; and

transmitting the replicated and addressed packets to the requesting client computers.

30 16. The computer-readable medium of claim 15, wherein:

the building instruction builds a VMC client table (VCT) file that includes the identities of the requesting client computers and the unicast addresses of the requesting clients; and

the computer-readable medium further comprises instructions for:

reading the VCT file for the identities of the requesting client computers and the unicast addresses of the requesting clients, wherein the replicating instruction addresses the packets per the unicast addresses of the requesting clients.

5

17. The computer-readable medium of claim 13, further comprising instructions for: selecting an optimal upstream virtual router; and forwarding a multicast request for the multicast content to the selected upstream virtual router.

10

18. The computer-readable medium of claim 17, wherein the selecting instruction comprises instructions for:

determining a router load on upstream virtual routers;

determining a round trip time on the upstream virtual routers; and

15

balancing the determined router loads and round trip times for the upstream virtual routers, wherein the selecting instruction selects the upstream virtual router with the best balance of router load and round trip time.

20

19. The computer-readable medium of claim 13, wherein the determining if the attached network is multicast enabled instruction comprises instructions for:

listening for Internet Group Management Protocol (IGMP) queries.

20. The computer-readable medium of claim 13, wherein the querying instruction comprises instructions for:

25

issuing virtual IGMP (VIGMP) queries, wherein VIGMP queries query client computers for VIGMP reports that request unicast or multicast delivery of the multicast content.

30

21. The computer-readable medium of claim 20, wherein the VIGMP reports that request unicast delivery of the multicast content include a unicast address for a requesting client computer and a multicast address for the multicast content.

22. The computer-readable medium of claim 13, wherein the listening instruction listens for virtual multicast requests from downstream virtual routers.

23. The computer-readable medium of claim 22, wherein the listening instruction listens for virtual multicast requests from downstream virtual routers by listening for Virtual Multicast Registration protocol (VMCRP) reports from the downstream virtual routers.

24. The computer-readable medium of claim 23, wherein the VMCRP reports include a unicast address for a requesting downstream virtual router and a multicast address for the multicast content.

25. A system for virtual multicasting (VMC) multicast content on non-multicast enabled networks, comprising:

a virtual router;

an attached network associated with the virtual router, wherein the attached network includes a plurality of client computers that have unicast addresses; and

wherein the virtual router includes software comprising instructions for:

determining if the attached network is multicast enabled;

if the attached network is not totally multicast enabled, querying for virtual multicast requests for the multicast content from non-multicast enabled client computers;

listening for virtual multicast requests, wherein at least one virtual multicast request includes a unicast address identifying a client computer of the network and a requested method of delivery for the multicast content; and

determining, based on the virtual multicast requests, which client computers request the multicast content, from the unicast addresses, and the requested methods of delivery for the multicast content.

26. The system of claim 25, wherein the virtual router software further comprises instructions for:

building a table of requesting client computers based on the requesting client computers determined from the determining step.

27. The system of claim 26, wherein the virtual router software further comprises instructions for:

receiving the multicast content, wherein the multicast content comprises a plurality of packets;

replicating the packets and addressing the packets per the table of requesting client computers; and

5 transmitting the replicated and addressed packets to the requesting client computers.

28. The system of claim 27, wherein:

10 the building instruction builds a VMC client table (VCT) file that includes the identities of the requesting client computers and the unicast addresses of the requesting clients; and

the virtual router software further comprises instructions for:

15 reading the VCT file for the identities of the requesting client computers and the unicast addresses of the requesting clients, wherein the replicating instruction addresses the packets per the unicast addresses of the requesting clients.

29. The system of claim 25, further comprising a plurality of upstream virtual routers, wherein the virtual router software further comprises instructions for:

20 selecting an optimal upstream virtual router; and

forwarding a multicast request for the multicast content to the selected upstream virtual router.

30. The system of claim 29, wherein the selecting instruction comprises instructions for:

determining a router load on upstream virtual routers;

determining a round trip time on the upstream virtual routers; and

25 balancing the determined router loads and round trip times for the upstream virtual routers, wherein the selecting instruction selects the upstream virtual router with the best balance of router load and round trip time.

31. The system of claim 25, wherein the determining if the attached network is multicast enabled instruction comprises instructions for:

listening for Internet Group Management Protocol (IGMP) queries.

32. The system of claim 25, wherein the querying instruction comprises instructions for:

issuing virtual IGMP (VIGMP) queries, wherein VIGMP queries query client computers for VIGMP reports that request unicast or multicast delivery of the multicast content.

33. The system of claim 32, wherein the VIGMP reports that request unicast delivery of the multicast content include a unicast address for a requesting client computer and a multicast address for the multicast content.

34. The system of claim 25, wherein system further comprises one or more downstream virtual routers and the listening instruction listens for virtual multicast requests from downstream virtual routers.

35. The system of claim 34, wherein the listening instruction listens for virtual multicast requests from downstream virtual routers by listening for Virtual Multicast Registration protocol (VMCRP) reports from the downstream virtual routers.

36. The system of claim 35, wherein the VMCRP reports include a unicast address for a requesting downstream virtual router and a multicast address for the multicast content.